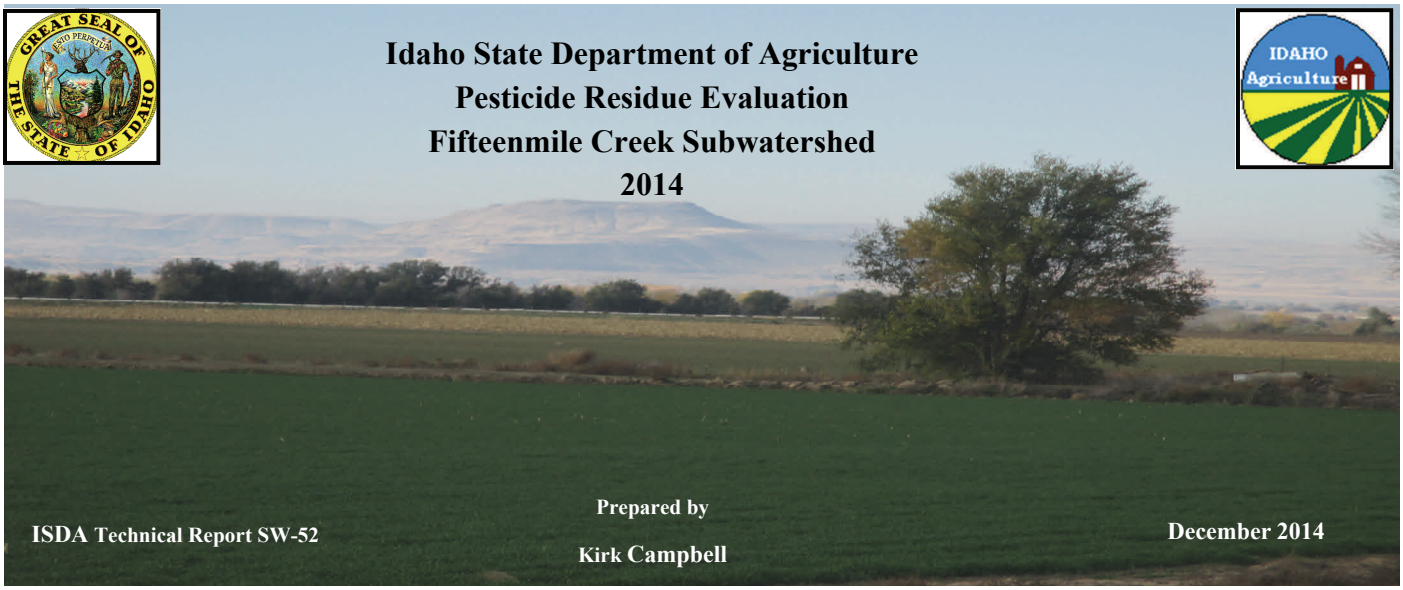

Idaho State Department of Agriculture
Pesticide Residue Evaluation
Fifteenmile Creek Subwatershed
2014

Prepared by

Kirk Campbell

ISDA Technical Report SW-52

December 2014

Introduction

The Idaho State Department of Agriculture (ISDA) conducted pesticide residue monitoring in 2014 on Fifteenmile Creek, Tenmile Creek, Fivemile Creek, Ninemile Creek and Eightmile Creek (Figure 1). This monitoring was a follow-up to monitoring conducted on Fifteenmile, Tenmile and Fivemile Creeks by ISDA in 2011. Two tributaries (Ninemile and Eightmile) that confluence with Fivemile Creek, were added for the 2014 study. Tenmile Creek and Fivemile Creek comprise the majority of the Fifteenmile drainage. Fifteenmile is a short stream section that flows approximately 3.6 miles prior to entering the Lower Boise River just southeast of Middleton, Idaho. A portion of Fifteenmile water is diverted into the Caldwell Highline Canal prior to discharging into the Lower Boise River. Ninemile and Eightmile Creeks were added to this study to evaluate their potential contribution of pesticide residues into Fivemile Creek.

Samples were collected on a bi-weekly schedule between April 29 and September 30, 2014. Samples were shipped on ice, overnight and analyzed by the University of Idaho Analytical Science Lab (ASL) located in Moscow, Idaho.

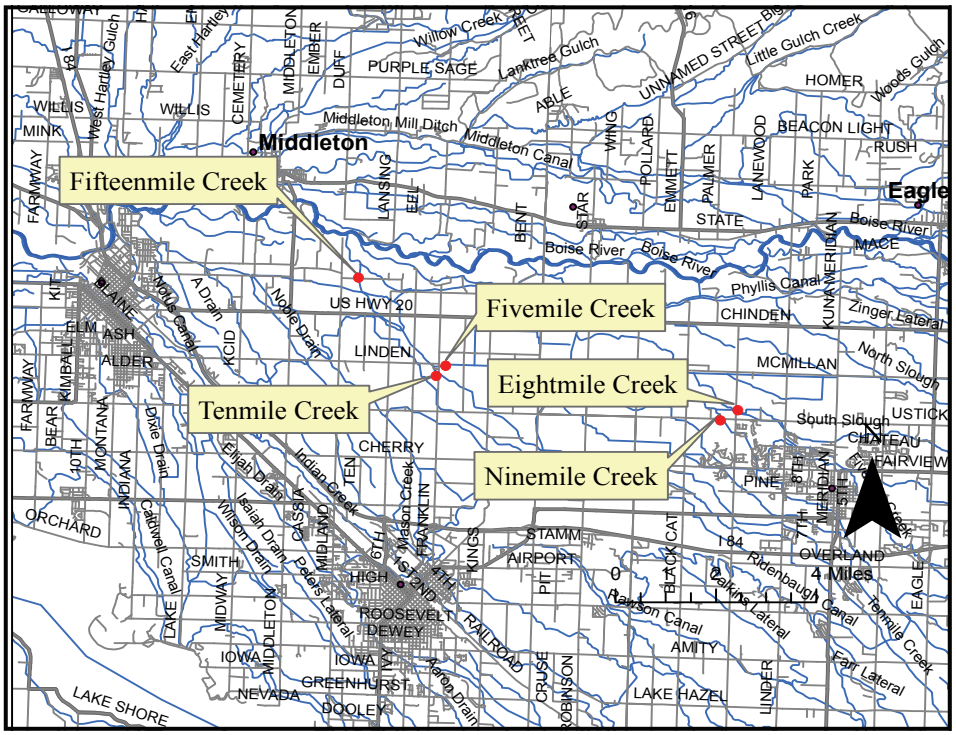

Figure 1. Map of sampling locations.

Pesticides of Concern

ISDA defines a pesticide of concern (POC) as any pesticide that is detected at a concentration that is greater than or equal to fifty percent (≥50%) of an established Environmental Protection Agency (EPA) Aquatic Life Benchmark. These benchmarks are developed for acute and chronic effects on fish and aquatic invertebrates and acute effects on vascular and nonvascular plants. Acute toxicity of a pesticide refers to the effects from a single dose or repeated exposure over a short period of time (i.e. a few hours or a day). Chronic toxicity is the ability of a substance to cause adverse health effects resulting from long-term or repeated low levels of exposure.

In 2014, the U.S.Environmental Protection Agency (USEPA) reevaluated the aquatic benchmarks for the herbicide atrazine. In conducting this evaluation, it was determined that atrazine's benchmark concentration for the vascular plant acute benchmark would be changed from 37 ppb to 0.001 ppb. All of the atrazine detections in 2014 exceeded the newly established, very low benchmark. The USEPA has no established benchmark for atrazine's degradate desethyl atrazine. Without guidance at this time, for desethyl atrazine, ISDA has been applying the same aquatic benchmarks that are available for atrazine. Using the atrazine's benchmark, all desethyl atrazine detections would surpass the vascular acute aquatic benchmark. At this time, ISDA will not be designating either atrazine or desethyl atrazine as a POC, based on this new benchmark, until further studies and evaluations are completed.

Overall Results

Combining all sites there were a total of 207 pesticides detected with 168 herbicides, 16 insecticides, 16 desethyl atrazine (degradate of atrazine), and seven fungicides (Table 1).

Table 1. Total pesticides detected along with common trade names, insecticides are in red.

Pesticide	Type	*Trade Name	# Detects	Pesticide	Type	*Trade Name	# Detects
2,4-D	H	Weedar 64	28	diuron	H	Karmex	12
atrazine	H	Aatrex	2	EPTC	H	Eptam	3
azoxystrobin	F	Heritage	7	hexazinone	H	Velpar	12
bentazon	H	Basagran	7	MCPA	H	Rhomene	1
bromacil	H	Hyvar X	4	methomyl	I	Lannate	2
bromoxynil	H	Buctril	13	metolachlor	H	Dual	11
chlorantraniliprole	I	VoliamExpress	1	oxamyl	I	Vydate	1
chlorpyrifos	I	Lorsban	12	oxyfluorfen	H	Goal	9
desethyl atrazine	D	—	16	simazine	H	Princep	1
dicamba	H	Dicamba 4	5	pendimethalin	H	Prowl	27
H = Herbicides, I = Insecticides, D = degradate of atrazine, F= Fungicides				terbacil	H	Sinbar	33
* Other trade names may apply. Pesticides in red are insecticides.							

Fifteenmile Creek

Fifteenmile Creek had a total of 16 pesticides identified consisting of 11 herbicides, three insecticides, one fungicide, and one degradate of atrazine (desethyl atrazine). Total detections were 68, with 59 herbicides, four insecticides, four desethyl atrazine and two fungicides. The pesticide of concern within Fifteenmile Creek was the insecticide chlorpyrifos, with four detections that were ≥50% of the EPA aquatic benchmark (Table 2). Chlorpyrifos is an organophosphate insecticide that can be toxic to fish and invertebrates. Two other insecticides methomyl and oxamyl, were detected at levels below any aquatic benchmark.

Table 2. EPA Aquatic Benchmarks and results for Fifteenmile.

Pesticide Detected	Pesticide Type	Number of Detections	Highest Detection ug/L	Fish Acute ug/L	Fish Chronic ug/L	Inverts. Acute ug/L	Inverts. Chronic ug/L	Non Vasc. Acute ug/L	Vascular Acute ug/L
2,4-D	H	8	0.61	12,075	14,200	12,500	16,050	3,880	13.1
atrazine	H	1	0.025	2,650	—	360	60	<1	0.001
azoxystrobin	F	3	0.039	235	147	130	44	49	3400
bentazon	H	1	0.37	>50,000	—	>50,000	—	4,500	5,350
bromoxynil	H	5	0.15	26.5	18	48	2.5	51	—
chlorpyrifos	I	4	0.092	0.9	0.57	0.05	0.04	170	—
			0.052	0.9	0.57	0.05	0.04	170	—
			0.090	0.9	0.57	0.05	0.04	170	—
			0.092	0.9	0.57	0.05	0.04	170	—
desethyl atrazine	D	4	0.090	2,650	—	360	60	<1	0.001
diuron	H	4	0.058	200	26	80	200	2.4	15
EPTC	H	1	0.48	7,000	—	3,245	810	1,400	5,600
hexazinone	H	2	0.11	137,000	17,000	75,800	20,000	7	37.4
methomyl	I	1	0.090	160	12	2.5	0.7	—	—
metolachlor	H	5	0.18	1,600	30	550	1	8	21
oxamyl	I	1	0.060	2,100	770	90	27	120	30,000
oxyfluorfen	H	4	0.074	101.5	1.3	40	13	0.29	0.35
pendimethalin	H	9	0.098	69	6.3	140	14.5	5.2	12.5
terbacil	H	11	0.55	23,100	1,200	32,500	640	11	140

Fivemile Creek

Fivemile Creek had a total of 17 pesticides identified which consisted of 14 herbicides, one insecticide, one fungicide, and one degrade of atrazine (desethyl atrazine). There were a total of 68 detections, with 59 being herbicides, four insecticides, three degradate of atrazine (desethyl atrazine), and two fungicides. Again, the insecticide chlorpyrifos had four detections that were ≥50% of the EPA Aquatic Benchmark (Table 3). Except for chlorpyrifos, there were no other pesticides of concern within Fivemile Creek.

Table 3. EPA Aquatic Benchmarks and results for Fivemile

Pesticide Detected	Pesticide Type	Number of Detections	Highest Detection ug/L	Fish Acute ug/L	Fish Chronic ug/L	Inverts. Acute ug/L	Inverts. Chronic ug/L	Non Vasc. Acute ug/L	Vascular Acute ug/L
2,4-D	H	8	0.71	12,075	14,200	12,500	16,050	3,880	13.1
atrazine	H	1	0.026	2,650	—	360	60	<1	0.001
azoxystrobin	F	2	0.084	235	147	130	44	49	3400
bentazon	H	5	0.59	>50,000	—	>50,000	—	4,500	5,350
bromacil	H	4	0.090	18,000	3,000	60,500	8,200	6.8	45
bromoxynil	H	4	0.17	0.15	26.5	18	48	2.5	51
chlorpyrifos	I	4	0.032	0.9	0.57	0.05	0.04	170	—
			0.034	0.9	0.57	0.05	0.04	170	—
			0.080	0.9	0.57	0.05	0.04	170	—
			0.19	0.9	0.57	0.05	0.04	170	—
desethyl atrazine	D	3	0.041	2,650	—	360	60	<1	0.001
dicamba	H	3	0.11	14,000	—	17,300	—	61	>3,250
diuron	H	4	0.051	200	26	80	200	2.4	15
EPTC	H	1	0.65	7,000	—	3,245	810	1,400	5,600
hexazinone	H	2	0.15	137,000	17,000	75,800	20,000	7	37.4
metolachlor	H	4	0.30	1,600	30	550	1	8	21
oxyfluorfen	H	1	0.058	101.5	1.3	40	13	0.29	0.35
pendimethalin	H	10	0.35	69	6.3	140	14.5	5.2	12.5
simazine	H	1	0.028	3,200	—	500	—	2.27	140
terbacil	H	11	0.44	23,100	1,200	32,500	640	11	140

Tenmile Creek

Tenmile Creek had a total of 17 pesticides identified, which consisted of 12 herbicides, three insecticides, one fungicide, and one atrazine degradate (desethyl atrazine). There were a total of 57 pesticide detections with 44 herbicides, six insecticides, four desethyl atrazine, and two fungicides. There were a total of five detections of the insecticide chlorpyrifos and they all were ≥50% of the EPA Aquatic Benchmarks for acute and chronic invertebrates (Table 4).

Table 4. EPA Aquatic Benchmarks and results for Tenmile

Pesticide Detected	Pesticide Type	Number of Detections	Highest Detection ug/L	Fish Acute ug/L	Fish Chronic ug/L	Inverts. Acute ug/L	Inverts. Chronic ug/l	Non Vasc. Acute ug/L	Vascular Acute ug/L
2,4-D	H	5	0.62	12,075	14,200	12,500	16,050	3,880	13.1
azoxystrobin	F	2	0.049	235	147	130	44	49	49
bentazon	H	1	0.25	>50,000	—	>50,000	—	4,500	5,350
bromoxynil	H	4	0.16	26.5	18	48	2.5	51	—
chlorantraniliprole	I	1	0.089	>600	110	4.9	4.5	1800	2000
chlorpyrifos	I	5	0.041	0.9	0.57	0.05	0.04	170	—
			0.034	0.9	0.57	0.05	0.04	170	—
			0.13	0.9	0.57	0.05	0.04	170	—
			0.027	0.9	0.57	0.05	0.04	170	—
			0.22	0.9	0.57	0.05	0.04	170	—
desethyl atrazine	degradate	4	0.035	2,650	—	360	60	<1	0.001
dicamba	H	1	0.099	14,000	—	17,300	—	61	>3,250
diuron	H	4	0.052	200	26	80	200	2.4	15
EPTC	H	1	0.18	7,000	—	3,245	810	1,400	5,600
hexazinone	H	2	0.15	137,000	17,000	75,800	20,000	7	37.4
MCPA	H	1	0.36	48,000	12,000	41,000	11,000	160	130
methomyl	I	1	0.052	160	12	2.5	0.7	—	—
metolachlor	H	2	0.099	1,600	30	550	1	8	21
oxyflourfen	H	4	0.095	101.5	1.3	40	13	0.29	0.35
pendimethalin	H	8	0.079	69	6.3	140	14.5	5.2	12.5
terbacil	H	11	0.76	23,100	1,200	32,500	640	11	140

Ninemile and Eightmile Creeks.

Ninemile and Eightmile Creeks drain a variety of land uses with a mixture of urban and agricultural activities. Both of these creeks drain into Fivemile Creek and were added to this program to determine their potential inputs of pesticide residues into Fivemile Creek.

Table 5. EPA Aquatic Benchmarks and results for Ninemile

Pesticide Detected	Pesticide Type	Number of Detections	Highest Detection ug/L	Fish Acute ug/L	Fish Chronic ug/L	Inverts. Acute ug/L	Inverts. Chronic ug/L	Non Vasc. Acute ug/L	Vascular Acute ug/L
2,4-D		3	1.1	12,075	14,200	12,500	16,050	3,880	13.1
desethyl atrazine		4	0.034	2,650	—	360	60	<1	0.001
hexazinone		3	0.30	137,000	17,000	75,800	20,000	7	37.4

Ninemile Creek only had three pesticides detected, two were herbicides and one was desethyl atrazine (Table 5). Overall, there were only 10 detections with six herbicides and four desethyl atrazine.

Table 6. EPA Aquatic Benchmarks and results for Eightmile

Pesticide Detected	Pesticide Type	Number of Detections	Highest Detection ug/L	Fish Acute ug/L	Fish Chronic ug/L	Inverts. Acute ug/L	Inverts. Chronic ug/L	Non Vasc. Acute ug/L	Vascular Acute ug/L
2,4-D		4	3.2	12,075	14,200	12,500	16,050	3,880	13.1
desethyl atrazine		1	0.027	2,650	—	360	60	<1	0.001
dicamba		1	0.25	14,000	—	17,300	—	61	>3,250
hexazinone		3	0.30	137,000	17,000	75,800	20,000	7	37.4

Eightmile Creek had four pesticides detected with three herbicides and one desethyl atrazine (Table 6). There was a total of nine detections with eight herbicides and one desethyl atrazine. It appears from this small data set that both Ninemile and Eightmile are not providing large inputs of pesticide residues into Fivemile Creek.

Conclusions

As previously mentioned, ISDA conducted monitoring on Fifteenmile, Tenmile, and Fivemile Creeks in 2011. By removing the detections from Ninemile and Eightmile Creek, from the 2014 data, we can compare the 2014 data to the 2011 data (Table 7). The overall detections were slightly up for the 2014 data that was primarily driven by the increase of herbicide detections. The number of insecticide detections actually went down from 2011 to 2014, while the desethyl atrazine (degradate of atrazine) remained the same. There were no fungicide detections during the 2011 monitoring.

Table 7. Pesticide data comparison from ISDA 2011 and 2014 monitoring

Year	Total Detects	Herbicides	Insecticides	Degradates	Fungicides
2011	172	133	28	11	0
2014	188	154	16	11	7

Unlike the 2014 data which only had chlorpyrifos as a POC, the 2011 data had chlorpyrifos, diazinon, ethoprop, and the herbicide linuron as POCs. Chlorpyrifos still dominated the number of detections for both studies as a POC (Figure 2). As can be seen in Figure 2, the concentrations for chlorpyrifos were somewhat higher during the 2014 season.

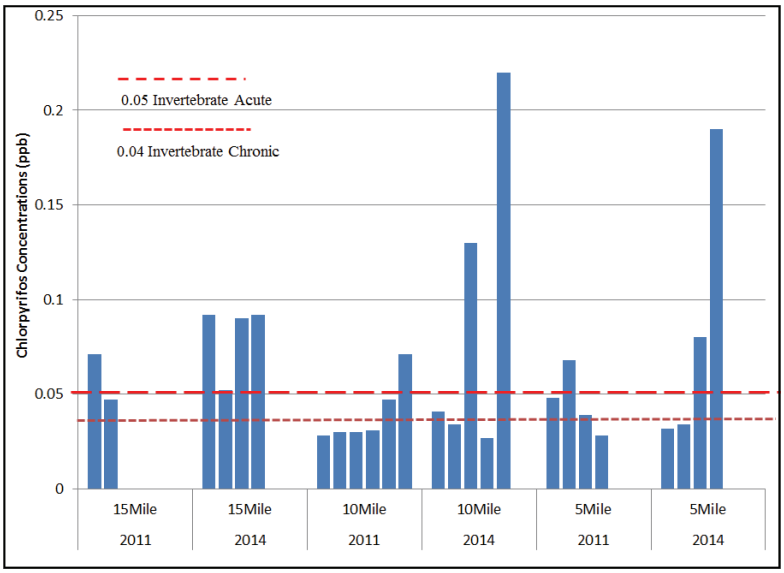

Figure 2. Chlorpyrifos comparison of 2011 and 2014 data

The data continues to indicate that both Fivemile and Tenmile continue to contribute pesticide residues into Fifteenmile Creek, which discharges into the Lower Boise River. Herbicides that normally have a higher concentration threshold for acute or chronic effects still dominate the overall detections. The continued presence of insecticides that have acute and chronic effects on invertebrates and possibly fish, at very low concentrations, is still of concern.

ISDA will continue to monitor and evaluate pesticides and their usage within the Lower Boise River Watershed. We will continue to work with applicators and stakeholders on education and BMP practices. ISDA pesticide inspectors will continue to evaluate the sales, handling, and usage areas for pesticides of concern.

References

Environmental Protection Agency, 2014. Office of Pesticides Programs' Aquatic Life Benchmarks.

Idaho State Department of Agriculture, 2011. Pesticide Residue Evaluation for Fifteenmile Creek, Tenmile Creek, and Fivemile Creek.